We claim:

1. A method of transmitting at a multiple antenna transmitter, comprising:

spatial steering parallel symbol streams and applying a transmission power to each symbol stream based on a statistical distribution of a channel.

2. The method of claim 1, wherein the spatial steering step steers the parallel symbol streams using respective steering vectors.

3. The method of claim 2, wherein the spatial steering step steers the parallel symbol streams using respective steering vectors determined based only on the statistical distribution of the channel.

4. The method of claim 3, wherein the determining the spatial steering step determines the spatial steering vectors as eigenvectors of an expected distribution of a matrix characterizing the channel multiplied by a transpose conjugate of the matrix

5. The method of claim 1, wherein the applying a transmission power step applies a transmission power for each symbol stream determined based on a previously determined transmission power for the symbol stream and the statistical distribution of the channel.

6. The method of claim 1, wherein the applying a transmission power step applies a transmission power for each symbol stream that tracks an optimal transmission power for the symbol stream.

7. A method of optimizing a transmit signal for a multiple antenna transmitter, comprising:

determining spatial steering of parallel symbol streams and a transmit power of each symbol stream based on a statistical distribution of a channel.

8. The method of claim 7, wherein the determining step determines respective steering vectors for the parallel symbol streams.

9. The method of claim 8, wherein the determining step determines the respective steering vectors based only on the statistical distribution of the channel.

10. The method of claim 9, wherein the determining step determines the steering vectors as eigenvectors of an expected distribution of a matrix characterizing the channel multiplied by a transpose conjugate of the matrix

11. The method of claim 7, wherein the determining step determines a transmission power for each symbol stream based on a previously

determined transmission power for the symbol stream and the statistical distribution of the channel.

12. The method of claim 11, wherein the determining step, for each symbol stream, comprises:

determining a first possible transmission power based on a *k*th transmission power for the symbol stream, where *k* represents an interval of time;

determining a second possible transmission power based on the *k*th transmission power for the symbol stream and the statistical distribution of the channel; and

determining the (*k*+1)th transmission power for the symbol stream based on the first and second possible transmission powers.

13. The method of claim 12, wherein the determining the (*k*+1)th transmission power further comprises:

selecting one of the first and second possible transmission powers; and

scaling the selected transmission powers for the symbol streams so that a sum of the selected transmission powers for the symbol streams does not exceed an available amount of power at a transmitter, the scaled selected transmission powers serving as the (*k*+1)th transmission powers.

14. The method of claim 13, wherein the selecting step selects a maximum one of the first and second possible transmission powers.

15. The method of claim 12, wherein the determining a second possible transmission power step determines the second possible transmission power based on the *k*th transmission power, the statistical distribution of the channel, and an available amount of power at a transmitter.

16. The method of claim 12, wherein the determining a second possible transmission power step determines the second possible transmission power based on the *k*th transmission power, the statistical distribution of the channel, and a noise power at a receiver.

17. The method of claim 12, wherein the determining a second possible transmission power step determines the second possible transmission power based on the *k*th transmission power, the statistical distribution of the channel and a number of receive antennas.

18. The method of claim 12, wherein the determining the second possible transmission powers step determines the second possible transmission powers according to the following expression:

for $m=1,\ldots,M$, where M is the number of transmit antennas,

$$p'_m(k+1) = \max\left(p_m(k), \frac{E[Tr\{\mathbf{B}_{-\mathbf{m}}\}] + P\frac{1-E[MSE_m(k)]}{p_m(k)} - N}{\frac{1}{M\sigma^2} E\left[MSE_m(k)\tilde{\mathbf{H}}_{\mathbf{m}}^{\mathbf{H}}\mathbf{B}_{\mathbf{m}}^{2}\tilde{\mathbf{H}}_{\mathbf{m}}\right]} \right)$$

where $p'_m(k+1)$ is a $(k+1)$th second possible transmission power for the mth symbol stream, N is a number of receive antennas, , $\tilde{\mathbf{H}} = \mathbf{HV}$ with $\mathbf{H}$ being an $N \times M$ matrix representing the channel between each transmit and receive antenna and $\mathbf{V}$ computed to be the eigenvectors of $E[\mathbf{H}^H\mathbf{H}]$,$\sigma^2$ indicates an arithmetic mean of the noise variances at the N receive antennas, the M matrices $\mathbf{B}_{-m}$, m=1,...,M, are given by

$$\mathbf{B}_{-m} = \left[I + \frac{1}{M\sigma^2} \tilde{\mathbf{H}}_{-\mathbf{m}} \mathbf{P}_{-\mathbf{m}}(\mathbf{k}) \tilde{\mathbf{H}}_{-\mathbf{m}}^{\mathbf{H}} \right]^{-1}$$

where $\tilde{\mathbf{H}}_{-m}$ and $\mathbf{P}_{-m}(k)$ indicate the corresponding matrices without the m-th column, and $\tilde{\mathbf{H}}_m$ denotes the m-th column of $\tilde{\mathbf{H}}$. In addition,

$$MSE_m(k) = \frac{1}{1 + \frac{p_m(k)}{M\sigma^2} \tilde{\mathbf{H}}_m^H \mathbf{B}_{-m} \tilde{\mathbf{H}}_m}$$

19. The method of claim 7, wherein the determining step determines a transmission power for each symbol stream that tracks an optimal transmission power for the symbol stream based on a previously determined transmission power for the symbol stream and the statistical distribution of the channel.